must marry a woman of his own division but not of his own clan. The orthodox marriage is that of cousins. The institution of polyandry still exists. When a girl marries a boy it is usually understood that she becomes also the wife of his brothers. "For all social and legal purposes, the father of a child is the man who performs a certain ceremony about the seventh month of pregnancy, in which an imitation bow and arrow is given to the woman." "Fatherhood is determined so absolutely by this ceremony that a man who has been dead for several years is regarded as the father of any children borne by his widow, if no other man has given the bow and arrow." The author considers it possible that the Todas are moving from polyandry toward monogamy through an intermediate stage of combined polyandry and polygeny.

In 'The Ethnology of Early Italy and its Linguistic Relations to that of Britain,' Professor R. S. Conway discussed the various suffixes used by the various tribes to form names of communities derived from names of places. There are only six or seven suffixes used for this purpose in ancient Italy and, of these, only three are significant for ethnology, viz., -co, -no and -ti (generally -ati).

The remaining paper, 'The Progress of Islam in India,' by Mr. William Crooke, admitted the increase of Islam and endeavored to ascertain the cause or causes of it. One of these is physical, tending to make the Mohammedans more fertile and more long-lived than the Hindus. The former are recruited from a more vigorous race, discourage infant marriage and the celibacy of widows, and permit a more varied and invigorating diet.

In addition to the above program, a member of Section H, Dr. Robert Munro, was invited to deliver one of the evening lectures arranged for by the association. Dr. Munro's subject was 'Man as Artist and Sportsman in the Paleolithic Period.'

Mention should also be made of a number not on the published program, a special treat provided for the anthropologists by Mr. James Hesketh, of Southport. The city is built upon blown sand. Some years ago, while engaged in street or sewerage construction, workmen came upon a rather large wooden structure buried some ten or twelve feet beneath the surface of the ground. Mr. Hesketh, on whose property the find occurred, had extensive excavations made prior to the meeting, in order that visiting scientists might see to best advantage what proved to be a pile dwelling or perhaps a landing for boats. A large fragment of a willow mat or basket was found by the piles. It resembles the bird-cage weave of the Clallam Indians. The site is now between one and two miles from the sea.

George Grant MacCurdy.
Yale University Museum.

Societies and Academies.

Biological Society of Washington.

The 376th meeting was held on Saturday, November 14.

W. H. Dall called attention to the doubt expressed by Dr. True, in a recent number of the *Proceedings* of the Biological Society, as to the existence of dorsal and ventral keels on the posterior part of the body of *Phocæna dalli*. Without offering any comments as to the presence or absence of this character in other porpoises, Mr. Dall showed by the original notes and drawings made at the time of the capture of the type of *Phocæna dalli* that such keels were certainly present in this species.

Lester F. Ward noted a curious case of scientific prediction in which ten species were named and described before they were discovered. This was done by Ehrenberg, who in working on the diatoms, classed by him as infusoria, described a number of species of *Actinocyclus* based on the number of rays. For most of these he had specimens, but for

the species with 27, 29, 30, 31, 37, 39, 41, 42, 44, 45, 46, 48 and 49 rays no specimens had at the time been discovered. Ten of these were found in 1843 and 1844, but the last four seem never to have come to light.

G. K. Gilbert spoke of the twisting of the pines, *Pinus balfouriana,* observed by him in the Kern River region. In many trees the wood had a distinct spiral twist, usually to the right, and the branches twisted in the same direction; in the exceptional cases where the twist was to the left, the branches, as a rule, also followed this direction.

Lester F. Ward presented a paper on 'The Dresden Cycad' (*Cycadeoidea Reichenbachiana*), giving a brief historical account of the cycad trunk from the salt region of Galicia that has been in the Dresden Museum since its discovery in 1753. Its true character as a cycad was made known by Göppert in 1844, when he named it *Raumeria Reichenbachiana,* and he described and figured the specimen in 1853. More recently it had been photographed by Geinitz and a copy of the photograph sent to the speaker, who surmised that the cycad had been mounted in an inverted position, and so stated in his 'Flora of the Black Hills.' In August, 1903, Mr. Ward visited Dresden and had an opportunity to examine the specimen carefully, finding that it was really inverted. The speaker gave as minute a description of the trunk as was possible without cutting sections to show the internal structure, stating that it shows a number of reproductive organs that promise good results when they shall be cut through and examined microscopically.

Under the title 'The Making of a Whale' F. A. Lucas described the making of the mold of an adult sulphur-bottom whale and the preparation of its skeleton, illustrating his remarks by slides from photographs by Mr. William Palmer. He said that in May Mr. Palmer, Mr. Scolliek and himself had been sent to a whaling station on the southern coast of Newfoundland, and told how the whales were captured there and made into oil and fertilizer. The method of making the mold, he stated, had been devised by Mr. Palmer, who was at present engaged on the reproduction of the animal for the St. Louis Exposition. F. A. LUCAS.

THE PHILOSOPHICAL SOCIETY OF WASHINGTON.

THE 571st meeting was held October 10, 1903. The first regular paper was by Mr. G. W. Littlehales, of the Hydrographic Office, on 'The Locus of Geographical Position and the Compass Error,' depending on the use of special large-scale diagrams and avoiding calculation.

This communication points out a short and simple simultaneous solution, by inspection, of the altitude and azimuth of a celestial body due to an estimated geographical position of the observer.

The results, which are applied directly to the problem of laying down the Sumner line of position and finding the total error of the compass, are obtained with a degree of precision which is well within the margin of error that is inseparable from observations made at sea.

A navigator having measured the true altitude of a celestial body and then deduced the altitude and azimuth of the observed body due to the estimated geographical position of the ship, can draw a line upon his chart through the estimated geographical position of the ship at right angles to the azimuth or true bearing of the observed celestial body, which might be appropriately called the Sumner line of position by account; and next comparing the instrumentally measured true altitude with the altitude due to the geographical position, he can at once draw the actual Sumner line of position, since it will be sensibly parallel to the line of position by account and removed from it by a perpendicular distance equal to the difference in minutes of arc between the observed and deduced altitudes and toward the direction of the observed celestial body or away from it, according as the true altitude obtained by observation is greater or less than the altitude deduced by dependence on the estimated geographical position.

If the compass bearing of the observed celestial body be noted at the time the observation for altitude is taken, the difference

between this bearing and the true azimuth of the body, which is deduced simultaneously with its altitude, will give at once the total error of the compass for the course upon which the ship heads at the time when the observation is made.

Mr. J. F. Hayford reported on 'The Longitude of Honolulu; Various Determinations from 1555 to 1903.' The final telegraphic result is $10^h\ 31^m\ 27^s.24\ .06$. The errors $\pm$ of the many older determinations were pointed out and discussed.

President Gore then read a paper on 'The Political Parties and Policies of Germany'—a study during the past summer at the time of the elections. He pointed out the constitutional relations between the government and the Reichstag and gave an account of the four political groups—Conservatives, Liberals, Particularists and Social Democrats—with their seventeen subdivisions, and the principal features of their platforms. Major Dutton in discussing the paper compared the parliamentary bodies of various lands.

The 572d meeting was held October 24, 1903. Professor Simon Newcomb spoke on 'The Coming International Congress of Science and Art at St. Louis, September 19 to 25, 1904.' He referred to the dissatisfaction that had followed most former congresses and the desire to provide something different for St. Louis. Two features of the plan decided on are noteworthy: (1) The unity of science is to be emphasized by a single congress, though meeting in as many sections as may be necessary. (2) The principal speakers are to be invited to present papers on specific assigned subjects. This rendered necessary a grouping in advance of the subjects that might properly come before the congress. The practical grouping adopted by the administrative committee, consisting of Professors Newcomb, Münsterberg and Small, was published in the May *Atlantic*.

During the past summer that committee has been visiting the learned men of Europe to secure participants in this congress; a considerable number of prominent scholars has been secured, each representing his special field.

President Gore, in the following discussion, pointed out that a congress was a proper adjunct to an exposition, for it represented the theoretical side of those activities whose practical side was represented by the exhibits.

Professor F. W. Clarke then spoke on 'The Dalton Centenary at Manchester' in commemoration of the announcement of the atomic theory, October 21, 1803. The speaker had delivered the memorial address, and here summarized it, pointing out the significance of Dalton's discovery. (The address was published in Science, October 23.) Sundry incidents of the festival were spoken of, and the fact noted that the statues in the fine town hall were not those of soldiers, but of scientific men—Dalton and Joule.

Professor Clarke added some account of the International Congress of Applied Chemistry at Berlin, and of his visits to various fine new laboratories; though he found none finer than some in this country.

President Gore told of his attendance at a meeting of the Berlin Academy of Sciences when memorial addresses were made on Virchow, and of the curious coincidence that he had also been present when Du Bois Reymond introduced the newly elected Virchow to the society.

Charles K. Wead,
Secretary.

New York Academy of Science,
Section of Anthropology and Psychology.

The regular meeting of the section was held October 20, in New Haven, Conn., in conjunction with the New York Branch of the American Psychological Association and the Philosophical Club of Yale University. The following papers were presented:

Localization of Brain Function: Dr. S. I. Franz, of Dartmouth Medical College.

Dr. Franz presented an account of an attempt to determine by physiological experiments whether or not the so-called motor areas are also sensory in function. Cats were used in the investigation, and the results indicate that in these animals the motor cortex has also certain sensory functions. It was not determined with what sensory processes

the areas are concerned, but results of clinical observations made it appear probable that the center for muscle sense is there localized.

The Application of the Concept of Variability in Reaction-Time Work: Dr. ROBERT YERKES, Harvard University.

Inasmuch as the degree of constancy of reaction-times differs for different species, individuals, conditions of the individual, modes and intensities of stimulation, it is clear that variability is an important quantity in the analysis of reactions, which should make possible the quantitative estimation of the influence of the various factors which play a part in determining the time of reaction.

The mean or average variability is generally determined in recent studies of reaction-time, but of far more importance for comparative work is what may be known as the relative variability. This quantity is an index of variability, which gives not the absolute variableness of the reaction-time, but the ratio of the variability to the time of reaction. For reaction-times, which are symmetrically distributed about a mode, the relative variability may be gotten from the formula

$$\frac{\text{mean variability} \times 100}{\text{mean}}.$$

In case of asymmetrical distribution Pearson's formula for obtaining the coefficient of variability should be used.

Examination of reaction-time statistics in which the variability is given indicates that the relative variability, as well as the time of reaction and the mean variability, decreases with increase in the strength of the stimulus. For electric stimulation this appears to be true from the threshold intensity to that which causes a reflex reaction, but in case of other modes of stimulation it is possible that beyond a certain point increase in intensity of the stimulus causes slower and more variable reactions.

Since the time of reaction varies with the intensity of the stimulus it is useless to compare reaction-times for different modes of stimulation, or those of different species or individuals, unless the relative variability is known. It is not improbable that careful investigation of the relation of relative variability to reaction-time will furnish a satisfactory basis for the accurate comparison of different results. To say that one person reacts more quickly than another to a given stimulus without taking into account the variability of the reaction-time is meaningless.

The 'Specious Present' and the Real Present: Dr. W. P. MONTAGUE, Columbia University.

A psychosis, like all systems, possesses in its totality a form or structure which is distinguishable, as the perceiving subject, from its individual contents, as perceived objects. Changes in the individual contents produce concomitant, though generally lesser, changes in the totality. The segment of duration or change perceived at any one moment is not itself a real change, but simply the *ratio of the change-rate of the individual contents to the change-rate of the totality, at that moment;* and this ratio, though finite and variable, does not itself require a finite time for its realization. Each unextended moment of 'real' time is thus adequate for the appreciation of an extended period of perceptual or 'specious' time.

The Effects of Practice on the Poggendorff Illusion: Mr. E. H. CAMERON and Mr. W. M. STEELE, Yale University.

This paper reported the results of a series of experiments dealing with the effect of practice on the Poggendorff illusion. (1) Quantitative determinations were made with a number of illusions; (2) practice with one illusion was carried on for an extended period; (3) determinations were again made with all of the illusions which were used before the practice series.

The apparatus used was demonstrated. The results show that the illusion tends to disappear after a period of seven weeks' practice. The effects of such practice were found to hold good for figures other than that with which the practice was made.

The Zöllner Figure: DR. CHARLES H. JUDD, Yale University.

This paper reported a series of quantitative determinations of the amount of illusion in the Zöllner figure when the figure was rotated

through 360 degrees and was divided so that the illusion for each of the long lines was determined without reference to the next long line. It was found that the illusion is not the result of equal deflections in opposite directions of the neighboring lines. In some cases one of two neighboring lines is not deflected at all, or even in a direction opposite to that usually assumed. The important deflection is in every second long line. Rotation through various angles shows that there are four positions in which deflection is great, four in which it is small.

Statistics of American Psychologists: Professor J. McKeen Cattell, Columbia University.

Professor Cattell described the methods he has employed to select 1,000 American men of science for scientific study. Among about 4,000 scientific men, there are about 200 psychologists. The methods by which they were arranged in the order of merit were explained, and the possibility of measuring degrees of scientific merit by the positions and probable errors was discussed. Some statistics were then given in regard to the academic origin, course and distribution of the psychologists. They were educated at 76 different colleges, this large dispersal indicating that in general psychologists are not greatly influenced by the institutions at which they study. The numbers who pursued graduate studies at different institutions were: Berlin 35, Leipzig 35, Columbia 31, Clark 31, Harvard 30, Cornell 25, Yale 16, Johns Hopkins 13. Of the 200 psychologists, all but eight are engaged in teaching or administrative educational work, being distributed among 77 institutions. Statistics were also given in regard to publications, from which it appears that the United States contributes about one seventh of the more important publications, leading in experimental psychology. The paper will be published in the *American Journal of Psychology.*

The Participation of the Eye Movements in the Visual Perception of Motion: Professor Raymond Dodge, Wesleyan University.

Photographic registration of the eye movements has exposed the poverty and inaccuracy of all introspective data with respect to their number, velocity and amplitude. While it shows that, even if our consciousness were full and exact in all three respects, it would be either useless or misleading as a datum in the visual perception of motion.

Every pursuit movement of the eyes is a definite muscular reaction to retinal stimulation. As such it is evidently conditioned both in direction and in velocity by some definite characteristics of the stimulus which occasions it. Since its accuracy can never transcend the accuracy of the data on which it occurs, it follows that the kinesthetic factor from a reactive pursuit movement could never correct nor materially augment the data furnished by the stimulus.

Moreover, the reaction of the eye involves a long reaction interval, about 160–170 σ. This suggests both the relative unimportance of the actual motor response and a considerable elaboration of the sensory data in what seems like a simple reaction. But any reaction interval at all renders it impossible for the actual eye movement to parallel the movement of the object of interest either in velocity or in amplitude.

Experimental verification of the above takes two forms: Whenever all other sensory data for the perception of motion are suppressed, except the hypothetical kinesthetic factor, there is no immediate perception of motion. And whenever the former are distorted by eye movements, the appearance of motion is respectively decreased or increased, entirely without correction by kinesthetic data.

On the Horopter: Dr. Geo. T. Stevens, New York City.

A horopter will be formed when the two eyes are so adjusted as to enable the image of the point fixed to be located exactly at the maculas of the two retinas. It follows that horopters succeed each other in endless variety and with amazing rapidity. With every glance a new horopter is developed. Two tenets constitute the essential foundation for the doctrine of the horopter the theory of actually horizontal and actually vertical meridians of the retinas and a doctrine of corresponding points.

Corresponding points of the two retinas are those which answer to proportional degrees of rotation of the eyes about the center of rotation, and which, from given individual points in the plane of fixation, each receive incident rays which must pass through the nodal points. They represent, therefore, the relation between the muscular and the retinal senses.

Intelligence and Movement: Dr. R. S. WOODWORTH, Columbia University.

In discussing the relations of 'Intelligence and Movement,' Dr. Woodworth argued that the mental cue of a voluntary movement was not ordinarily a kinesthetic image of the movement. Even in learning a new movement, experiment shows that no such image need be present. Since voluntary movement is developed from instinctive, the original mental cue must have been that provided by instinct, and the instinctive cue is never an image of the movement about to be made. The actual sensation of a movement can evidently not be the stimulus to that same movement, and the reproduced sensation can hardly have a motor power not possessed by the sensation itself.

The Minimal Value of the Psychophysical Reaction-Time: Professor LIGHTNER WITMER, University of Pennsylvania. Read by title.

Primary and Secondary Presentations: Mr. H. R. MARSHALL, New York City. Read by title.

JAMES E. LOUGH,
Secretary.

SECTION OF ASTRONOMY, PHYSICS AND CHEMISTRY.

AT the meeting of the section on November 2, Dr. Bergen Davis read a paper on 'The Electrical Conductivity and Absorption of Energy in the Electrodeless Discharge.'

The discharge was produced in a globular vessel by the high frequency discharge from a Leyden jar system. The vessel in which the discharge was produced contained electrodes which were connected through a galvanometer to a source of E.M.F. of 220 volts. When the discharge passed in the vessel, the gas became a good conductor. The conductivity as indicated by the galvanometer was found to depend on the pressure of the gas somewhat. That is, when the pressure becomes so low that the white discharge appeared, the conductivity increased to near a maximum. It remained nearly constant until at a low pressure the discharge disappeared, when the conductivity became zero.

The absorption of energy was measured by placing a hot-wire galvanometer in the circuit leading from the jars to the coil surrounding the vessel. The oscillating current passing through this galvanometer and coil can be expressed by

$$c\,Ae^{-qt} = \cos pt.$$

The greater part of the energy is dissipated in heating the gas and the vessel. The energy will be proportional to the square of the current, while the galvanometer reads current direct. Hence

$$\text{Reading} \propto \int_0^\infty e^{-2qt} \cos ptdt,$$

$$\text{Readings} \propto \frac{2p^2 + 3q^2}{4q(p^2 + q^2)},$$

$$\text{Readings} \propto \frac{1}{q}.$$

That is: a certain reading is obtained without the vessel in the coil. When the discharge passes in the vessel, the readings drop back to a smaller value. This drop-back is proportional to the dissipation q in the circuit. The energy absorbed reaches a maximum near the pressure at which the discharge first appears. It steadily decreases and becomes zero again at the pressure at which the discharge disappears.

A second paper was read by Dr. Charles Lane Poor, on 'The Measurement of Racing Yachts.'

The measurements discussed in this paper are made for the purpose of classifying the yachts and furnish a basis for handicapping them in racing. From such measurements, made of the hull, spars and sails, an expression is found for the 'theoretical speed,' or speed the yacht should make under normal conditions. While every little detail of hull and rigging contributes its part in producing a fast yacht, yet it is manifestly impossible to take account of all such details in finding the

'theoretical speed'; only the main factors can be considered. These factors, which enter the rules in common use, are length of hull, sail area and displacement.

It was shown that the rules introduce these factors in such a way as to involve the assumptions that speed is proportional to: (*a*) The square root of length; (*b*) the fourth root of sail area; and that the New York Yacht Club rule involves these two assumptions and the additional one that speed is proportional to (*c*) the inverse sixth root of displacement.

Dr. Poor discussed these assumptions in detail and showed that, while there is some apparent basis for the assumption in regard to length, there appears to be no scientific basis for those in regard to sail area and displacement. In fact, the available data seem to point to the conclusion that the assumption in regard to sail area is wrong, that speed is more nearly proportional to square root of sail area. In support of this view the results of many races between two yachts in 1902 and 1903 were used. Dr. Poor called attention to the scientific aspect of the problem, and suggested several lines of experiment, by means of which the relationship between speed and the factors of measurement could be determined.

S. A. Mitchell,
Secretary.

CLEMSON COLLEGE SCIENCE CLUB.

At the meeting of October 17 Dr. R. N. Brackett discussed 'An Improved Welsbach Mantle.' A brief historic review of Welsbach's work in originating and perfecting the mantle which bears his name was given. The experiments in varying the proportions of the rare earths and observing the effects produced were mentioned. As a result of these experiments, the best results seem to be obtained with a mixture of the rare earths in the proportion of approximately 99 parts of thoria to 1 part of ceria. The explanations which have been offered for the phenomena observed in the use of the mantle were mentioned. The recent improvements by which the mantles have been hardened and thus adapted to use in railway trains, etc., were pointed out.

Professor Chas. E. Chambliss read a paper entitled 'A Destructive Rice Pest.' The speaker referred almost exclusively to his own observations made in the rice fields during the early spring and late summer. The pest to which reference was made was the bird known locally as the rice bird, and in the north as the bobolink. The habits of the bird in the rice fields of the south, where it stops only on its way to and from South America and the northern United States, where it breeds, were mentioned. Also the extent of the damage done by the birds on their first and second visits to the fields was pointed out. The two methods in use at present for combating this pest were given. These consist in tarring the grain, previous to sowing, and in frightening the birds by the explosions of firearms. The first method is used only in a limited way, the second being the one almost universally employed. The speaker referred to the inefficiency of both methods, and according to his observations the bird is more easily frightened by the passing of shadows than it is by firearms. The possibility of the use of trained hawks for combating this pest was pointed out.

The next and last paper on the program was 'Cultural Studies of a Nematode,' by Dr. H. Metcalf. Under this title there was given an account of investigations into the cause of decay and 'damping off' in a number of different plants. A nematode, a *Fusarium* and several bacteria were found associated with the disease. It was necessary to devise special methods for isolating the nematode. Final results of inoculation indicated that the plant organisms were the direct cause of the decay, but that the nematode played an important part in spreading the infection. By way of illustration living specimens of the nematode were projected on the screen. This paper will be published in the *Proceedings of the American Microscopical Society.*

F. S. Shiver,
Secty.-Treas.

Clemson College, S. C.,
October, 1903.